EDITORIALS

Scientific Methods in Medicine

THE SCIENTIFIC METHOD is often spoken of as though it were something immutable, objective and uniquely revealing about nature and humankind. In medicine we think of the scientific method as being productive of dependable knowledge about how to prevent or repair human ills. We tend to look somewhat askance at diagnosis and treatment which is not scientific, that is not established as valid by the method of science. No doubt this is because modern science has brought medicine into a new era of enormously greater understanding and achievement.

If one takes even a cursory look at the history of science one is hard put to find any simple definition of just what is science or what is scientific method. Rather one gets a sense that scientific methods change with or are adapted to the problems to be solved. A basic criterion seems to be whether or not a method works at a particular time for a particular problem. In this sense it is probable that throughout its history medicine has generally reflected the science of its times. Certainly physicians have always tried to separate what works in diagnosis and treatment from what does not, and to this extent medicine has always been scientific.

But modern medicine considers itself more scientific than the medicine that preceded it, and no doubt this is so. It has accepted in principle the purist approach of what might be called linear science, where a cause must be shown to produce a predictable effect in a given or controlled set of circumstances. This is the method that underlies such things as Koch's postulates and the more modern prospective double-blind studies or experiments. This method has made possible many of the major scientific advances in modern medicine. But it has drawbacks. It is difficult, often impossible, to control all of the variables in a given study or experiment, and the linear process often takes time—and too often too much time. Results are needed sooner, not later, to be useful in medical practice.

A second method is coming into increasingly wide use. It draws conclusions that seem to work from epidemiologic data. An example of this is the association which has been shown statistically to exist between cigarette smoking and lung cancer. The method circumvents the need to prove in linear fashion that some substance in cigarette smoke is the cause of lung cancer. Indeed the method seems more horizontal than vertical or linear, in that it infers rather than proves cause and effect by documenting statistical coincidence. But it meets our criterion for a scientific method because it works. It has been shown that when certain groups increase their smoking the incidence of cancer goes up and when others reduce their smoking the incidence goes down. And it significantly foreshortens the time and cost that would be necessary to establish this relationship by a more traditional statistically significant prospective study.

It is suggested that in medicine we may be on the verge of needing yet another scientific method that works. In most situations in health and illness many changing factors are at work at any given moment and they are in dynamic interaction with one another. Here the causes and effects are multifactorial. At hand is a rapidly developing electronic technology which is capable of making almost instantaneous calculations involving many

moving or changing elements. It is possible, and to be hoped, that this technology or something like it will make possible yet another scientific method for medicine which can be applied to the study of the ever-changing, interacting and as yet poorly understood multifactorial aspects of health and disease. Such a method is sorely needed.

It seems obvious that there is more than one acceptable scientific method in medicine and that more are probably needed. It is suggested that a basic criterion of whether a method is scientific or not is whether it works for the purpose intended. For medicine it is essential that methods be developed that work well enough, even if not perfectly, and that they produce timely results in terms of the life span of both physicians and their patients.

—MSMW

Scurvy, Ascorbic Acid and Megavitamins

DESPITE ADVANCES in medicine, improved living conditions and nutrition, scurvy still exists in urban centers.[1] A great deal is now known about its pathophysiology. Severe ascorbic acid deficiency affects the metabolism of collagen, folate and iron. The most important defect in scurvy is abnormal collagen biosynthesis. It leads to the escape of blood into tissues, the key clinical feature.

In this issue Richard Vilter, distinguished professor of medicine of the University of Cincinnati, reports on the history and clinical aspects of scurvy. Long familiar with the condition, he gives a detailed, scholarly account of the biochemistry of ascorbic acid deficiency. He lists the diseases, from common cold to cancer, for which ascorbic acid, usually in very large doses, has been tried and reports how these various applications are long on theory and short on solid data. He also points out that megadoses of ascorbic acid may not be innocuous. The only reasonable indication for the prescription of a large dose of vitamin C is the Ehlers-Danlos syndrome, which is caused by a congenital, qualitative defect of collagen. Vilter's article makes it clear that vitamin C, similar to vitamin B_{12}, has an extremely narrow range of effectiveness: In deficiencies, administration of these vitamins produces spectacular clinical successes, but these triumphs are not transferrable to conditions where no lack exists. It may be tempting to use potent agents that are relatively free from side effects in large doses where cures as yet do not exist, but this romantic approach to clinical problems does not work.

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REFERENCE

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Shortcuts to Athletic Success?

FROM THE ARTICLE "Chemical Warfare: Drugs in Sports," elsewhere in this issue, it would appear that scientific documentation of efficacy is not among the criteria used in selecting chemical or nutritional ergogenic aids for athletes. While some of the substances have legitimate uses for persons who are less than healthy (for example, packed red cells for anemic patients and anabolic steroids for those who are cachectic), it seems a perversion of science to administer them to the fit in hopes of attaining suprafitness. In spite of documented undesirable side effects and (generally) undocumented desirable results, the search for new substances and the continued use of *traditional* chemical aids apparently go on unchecked—save for the efforts of the Olympic drug testing group.

The multimillion dollar testing for the presence of "doping substances" apparently has had some deterrent effect; there have been fewer medals withdrawn in recent years. Yet if this deterrent effect truly exists—and is not just temporary avoidance of prohibited substances during selected international events—why then do the testing procedures become more comprehensive, sophisticated and expensive each year?

Elaborate drug testing may indeed aid in ferreting out cheaters but it also piques the curiosity of that group of zealous competitors who would dearly love to find a shortcut to athletic excellence. It is difficult to convince these people that the testing is done to avoid serious health hazards rather than to discover the presence of substances that might indeed enhance performance. In short, publicizing the use of elaborate testing methods might actually encourage the use of the substances for which the tests are being done.

Although dealing with the effects of *doping* in internationally competitive athletes is not among